DISC MOUNTING ASSEMBLY FOR A VERTICAL TILLAGE IMPLEMENT

FIELD OF THE INVENTION

The present invention relates to agricultural implements for vertical tillage including a plurality of disc supporting tillage units supported on a main frame, and more particularly the present invention relates to a hub and shaft arrangement for rotatably supporting a ground engaging disc on the disc supporting arm of a respective one of the tillage units.

BACKGROUND

As described in U.S. Patent Application Publication No. US 2012/0312569 by Redekop, in one known form of conservation tillage, the soil is minimally disturbed prior to planting in order to allow air to penetrate the mat of crop residue. This technique is variously known as minimum tillage, residue management, soil aeration or seedbed aeration. A farm implement, sometimes known as a vertical tillage implement, is used to cut the crop residue and penetrate a short distance into the surface of the soil while lifting the soil vertically to permit access of air to the soil.

A known construction of a vertical tillage implement comprises a main frame supporting a plurality of tillage units thereon in which each tillage unit comprises a disc supporting arm which is resiliently mounted relative to the main frame. A disc assembly is then mounted on the trailing end of the disc supporting arm in the form for a shaft and a hub which rotatably supports a ground engaging disc on the shaft.

During use of the vertical tillage implement, the soil is fractured in such a manner that a considerable amount of side flowing soil and residue movement results. Maintenance of prior art hub and shaft arrangements due to penetration of soil and residue into the bearing thereof is thus a known concern.

SUMMARY OF THE INVENTION

According to one aspect of the invention there is provided a disc assembly for use with a vertical tillage implement having a main frame supporting a plurality of tillage units thereon in which each tillage unit includes a disc supporting arm mounted on the main frame, the disc assembly comprising:

a shaft arranged to be mounted on the disc supporting arm of a respective one of the tillage units;

a hub supported on the shaft such that the hub is rotatable about a longitudinal axis of the shaft, the hub including:

an annular body portion supported concentrically about the shaft to extend in an axial direction between an inner end and an opposing outer end;

a disc mounting portion provided externally on the annular body portion so as to be arranged to mount a ground engaging disc on the hub;

a cap portion arranged to enclose the outer end of the annular body portion;

a first annular flange portion oriented circumferentially about the shaft and protruding in the axial direction from the inner end of the annular body portion; and

a second annular flange portion oriented circumferentially about the shaft and portion protruding in the axial direction from the inner end of the annular body portion;

the second annular flange portion being smaller in circumference than the first annular flange portion so as to define a groove between the first and second annular flange portions which extends circumferentially about the shaft at the inner end of the annular body portion;

an end plate mounted fixedly on the shaft so as to substantially enclose the inner end of the annular body portion, the end plate including an annular tongue portion protruding axially from an interior side of the end plate so as to be matingly received within the annular groove between the first and second annular flange portions for relative rotation therebetween.

The resulting sinuous path between the tongue portion of the end plate and the pair of annular flange portions of the hub has been found to considerably minimize penetration of soil and residue through the rotatably interface of the hub to the interior of the hub where bearings are located. Accordingly this has the advantage of minimizing maintenance required with regard to the bearings which rotatably support the hub and disc on the shaft of each disc assembly on a vertical tillage implement.

Preferably there is provided a generally U-shaped clearance gap between the annular tongue portion and the annular flange portions such that the annular body portion and the end plate do not directly contact one another.

A first radial gap portion between the tongue portion and the first annular flange portion preferably increases in radial dimension in the axial direction towards an exterior of the annular body portion from a first end to a second end of the first radial gap. The first radial gap portion may be less than 0.050 inches in dimension along a full length in the axial direction between the first end and the second end thereof. More preferably, the first radial gap portion varies from a dimension from 0.015 inches to 0.030 inches.

A first end gap portion in the axial direction between an inner end of the tongue portion and the inner end of the annular body portion in proximity to the first end of the first radial gap, preferably has a dimension which is less than the second end of the first radial gap. More particularly the first end gap may be less than 0.050 inches in dimension and is preferably approximately 0.015 inches.

Preferably the first annular flange portion is substantially flush with an exterior side of the end plate.

A second radial gap between the tongue portion and the second annular flange portion preferably also increases in radial dimension in the axial direction towards an interior of the annular body portion from a first end to a second end of the second radial gap. The second radial gap is preferably less than 0.05 inches in dimension along a full length in the axial direction between the first end and the second end thereof. More preferably the first radial gap portion varies in dimension from 0.015 inches to 0.030 inches.

Preferably a second end gap is provided in the axial direction between a free end of the second annular flange portion and the interior side of the end plate which has a dimension which is less than 0.050 inches, and more particularly is approximately 0.030 inches.

The interior side of the end plate may further include a shoulder portion protruding axially inwardly at a location which is radially inwardly from the tongue portion and which is in close proximity to the second annular flange portion so as to be arranged to define a generally S-shaped clearance gap between the annular flange portions of the annular body portion and the tongue portion and the shoulder portion of the end plate. Preferably the annular body portion and the end plate remain in a non-contacting relationship along a length of the S-shaped clearance gap between an interior and an exterior of the annular body portion.